

Revised Date: 09/09

Chem 1040 General Chemistry II (3-0-3)

Course maximum enrollment: 25

Special Facility or Equipment Needed: Lecture room with facilities for lecture/demonstration with multimedia available and preferably running water/sink; student desks suitable for note-taking

Lab fee: none

Course Description: Principles and problems of chemistry.

Pre- and Co-requisites: Prerequisite a grade of “C” or better in Chem 1030 and 1031.

Texts and Readings: General Chemistry: The Essential Concepts 5th edition or latest edition (ISBN: 13-978-007-3311-852) *Raymond Chang*, McGraw-Hill Companies.

Course Goals: This course emphasizes problem solving and conceptual understanding of basic principles of chemistry using examples which can be applied to everyday life.

Course Objectives:

The student should be able to:

- describe the properties of liquids and solids in terms of motions of molecules.
- calculate heat transfer in solids and liquids with and without phase change.
- interpret P/T phase diagrams.
- describe the factors that affect solubility and calculate and describe colligative properties.
- calculate concentrations of solutions.
- explain and calculate problems involving calorimetry and Hess’s Law
- explain and calculate standard states, enthalpy changes, changes in bond energy and changes in internal energy.
- explain and calculate the concepts of entropy and Gibb’s free energy.
- explain and derive rate law expressions for chemical reactions.
- explain, derive and apply integrated rate expressions for chemical reactions.
- explain the collision theory of reactions.
- describe the relationship between reaction mechanisms and the rate law.
- describe and explain homogenous and heterogenous catalysis.
- explain and apply the Arrhenius equation.
- describe dynamic equilibria in terms of LeChatelier’s principle.
- write equilibrium constant expressions from balanced chemical equations and solve problems using these expressions.
- describe and explain the difference between the reaction quotient and the equilibrium constant expression and predict the direction of the chemical reaction.

- describe the relationships between ΔG and equilibrium constant.
- recognize and describe ionization of strong electrolytes and calculate ionic concentration.
- describe the autoionization of water.
- recognize and describe ionization of weak acids and bases and calculate hydrogen ion concentration given the dissociation constant and concentration of acid or base.
- describe and calculate pH and pOH
- describe the action of buffers and calculate the pH of a buffer.
- describe and write equations illustrating hydrolysis of salts.
- calculate pH of solutions of salts.
- describe the regions of a simple titration curve.
- write solubility product expressions and calculate concentrations of insoluble salts.

Course Content/Outline:

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| Week 1: | Liquids and solids, heat transfer Phase changes and interpretation of phase diagrams |
| Week 2: | Solutions |
| Week 3: | Chemical thermodynamics I; the first law and changes in enthalpy |
| Week 4: | Chemical thermodynamics II; calorimetry and Hess's Law |
| Week 5: | Spontaneity of chemical and physical changes |
| Week 6: | Review, Examination 1, feedback |
| Week 7: | Chemical kinetics I; reaction rates and rate law expressions |
| Week 7: | Chemical kinetics II; integrated rate equations and collision theory |
| Week 8: | Chemical kinetics III; transition state theory, reaction mechanisms and the Arrhenius equation |
| Week 9: | Chemical equilibrium I; equilibrium constant and the reaction quotient |
| Week 10: | Chemical equilibrium II; LeChatelier's principle and K_p and K_c ; relationship between equilibrium constant and ΔG |
| Week 11: | Review, Examination 2, Feedback |
| Week 12: | Ionic equilibrium I; strong and weak electrolytes, autoionization of water, pH and pOH, dissociation constants of weak monoprotic acids |
| Week 13: | Ionic equilibrium II; buffers and the common ion effect, salts of strong and weak acids and bases, titration curves |
| Week 14: | Ionic equilibrium II; solubility product |
| Week 15: | Review |
| Week 16: | Final Examination |

Assessment:

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| Examinations | 300 points |
| Weekly quizzes | 100 points |
| Reports/Paper on selected topic | <u>100 points</u> |
| Total | <u>500 points</u> |

Reading and Writing Across the Curriculum: The reading and writing components of these aforementioned assessments satisfies the Reading and Writing Across the Curriculum requirement as stipulated in SLCC's academic policy.

Grading/Absence Policies:

Three examinations are given. Final grade will be based on the cumulative points. The recommended scale is:

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| 90% and above | A |
| 80-89% | B |
| 70-79% | C |
| 60-69% | D |
| Below 60% | F |

Make up examinations and quizzes will be given only to those persons having legitimate excuses. The instructor should be contacted in advance—not after—the examination. It is the discretion of the instructor to accept an excuse. It is the responsibility of the student to arrange with the instructor for make up examinations and quizzes. Typically, make up quizzes will not be given. The lowest quiz grade or a quiz that is missed will be dropped. Students who miss 10% of class meetings will be advised to see a counselor. Students who merely stop attending and chose not to withdraw will earn an “F” for the course.

Students with Disabilities: Students with disabilities that may require assistance or accommodation or with questions related to any accommodations for testing, note takers, readers, etc. should contact the instructor as soon as possible. Students may also contact the Dean of Students with questions about such services.

Emergency Evacuation Procedure: A map of this floor is posted in the front of the building. This map marks the evacuation route and the Designated Rescue Area. This area is where emergency service personnel will go first to look for individuals who need assistance in exiting the building. Student who may need assistance should identify themselves to the teaching faculty.

Academic Dishonesty: A student will receive a grade of zero on an assignment or test for the following: cheating, plagiarism, or collusion. Any student who commits or attempts to commit any of these acts will be subject to disciplinary proceedings as detailed in the Student Discipline Procedures Outlined in the Student Handbook.